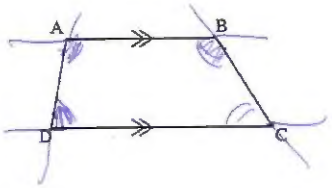
Special Quadrilaterals

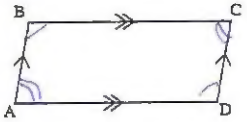
Trapezium

- A trapezium has two parallel sides.
- The sum of the interior angles at the ends of each non-parallel side is 180°. That is,
  $\angle A + \angle D = 180°$ and $\angle B + \angle C = 180°$



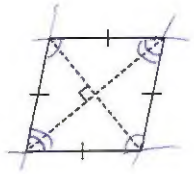
Parallelogram

- A parallelogram has opposite sides parallel.
- Its opposite sides are equal.
- Its diagonals bisect each other.
- Its opposite angles are equal. That is,
  $\angle A = \angle C$ and $\angle B = \angle D$



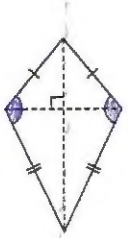
Rhombus

- A rhombus is a parallelogram with all its sides equal.
- Its diagonals bisect each other at right angles.
- Its diagonals also bisect the angles at the vertices.



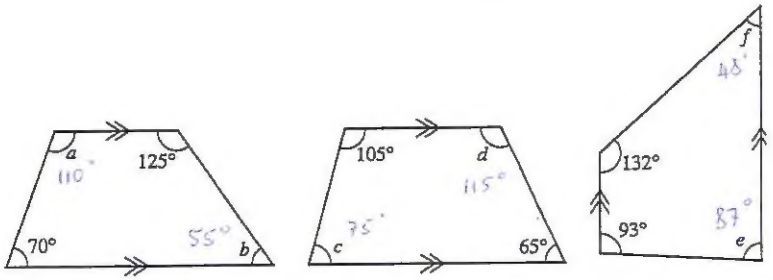
Kite

- A kite is a quadrilateral with two pairs of equal adjacent sides.
- Its longer diagonal bisects its shorter diagonal at right angles.
- The opposite angles between the sides of different lengths are equal.

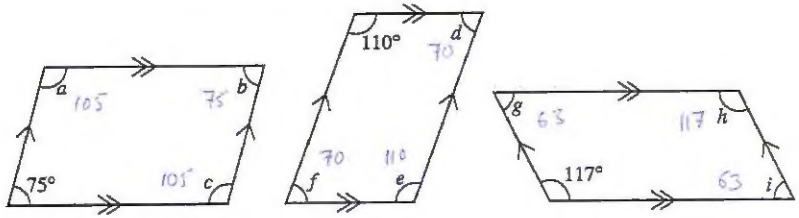


Exercise 5B

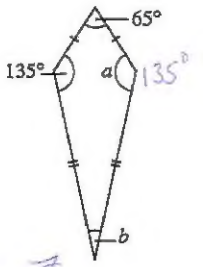
1 For each of these trapeziums, calculate the value of the lettered angles.



2 For each of these parallelograms, calculate the value of the lettered angles.

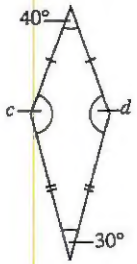


3 For each of these kites, calculate the value of the lettered angles.



$b = 360 - (2 \times 135 + 65)$

$b = 25°$



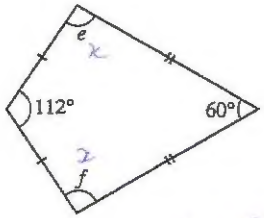
$c + d = 360 - (30 + 40)$

$c + d = 290$

$2c = 290$

$c = 145$

$d = 145$

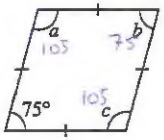


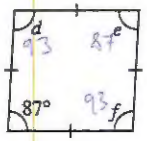
$2x = 360 - (112 + 60)$

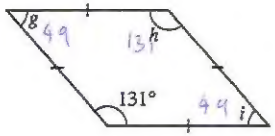
$2x = 188$

$x = 94°$

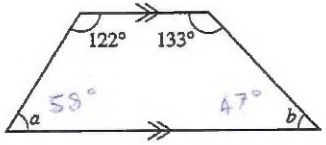
4 For each of these rhombuses, calculate the value of the lettered angles.

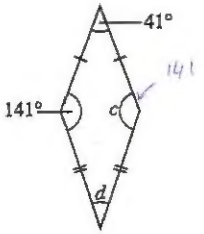


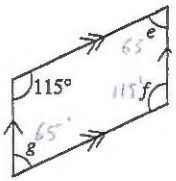




5 For each of these shapes, calculate the value of the lettered angles.





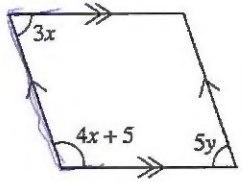


$d = 360 - (2 \times 101 + 41)$

$d = 37°$

6 Calculate the values of x and y in each of these parallelograms.

a



$3x + 4x + 5 = 180$

$7x = 175$

$x = 25°$

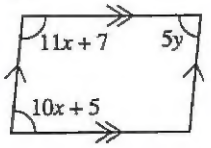
$4x + 5 + 5y = 180$

$100 + 5 + 5y = 180$

$5y = 75$

$y = 15°$

b



$21x + 12 = 180$

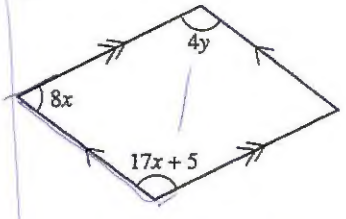
$x = 8°$

$5y = 10x + 5$

$5y = 85$

$y = 17°$

c



$25x + 5 = 180$

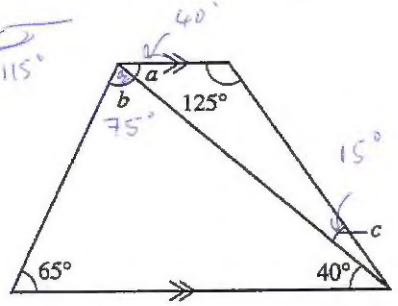
$x = 7°$

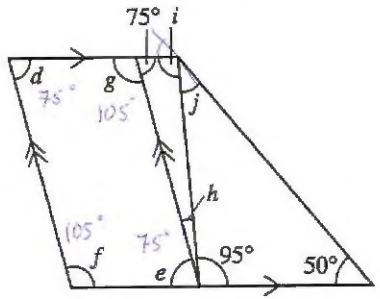
$17x + 5 = 4y$

$124 = 4y$

$31° = y$

7 For each of these shapes, calculate the value of the lettered angles.





$a = 40°$

$b = 75°$

$c = 15°$

$h = 180 - 95 - 75$

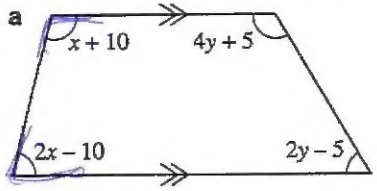
$= 10°$

$i = 180 - 75 - 10 = 95°$

$j = 180 - 95 - 50 = 35°$

8 Calculate the values of x and y in each of these trapeziums.

a



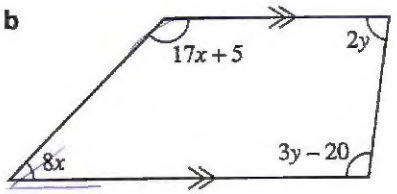
$3x = 180$

$x = 60°$

$6y = 180$

$y = 30°$

b



$25x + 5 = 180$

$x = 7°$

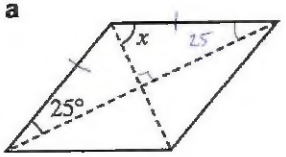
$5y - 20 = 180$

$5y = 200$

$y = 40°$

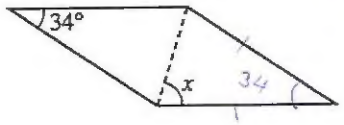
9 Calculate the value of x in each of these rhombuses.

a



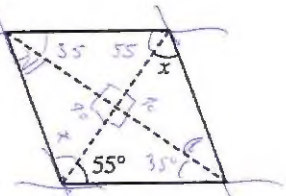
$x = 65$

b



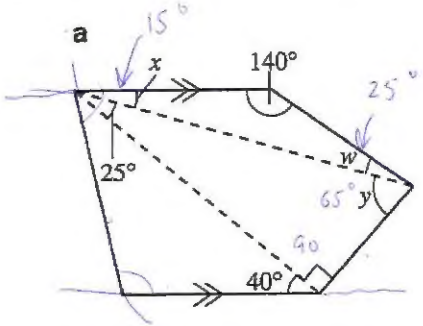
$\frac{180 - 34}{2} = 73°$

c



10 Calculate the values of the letters in each of these shapes.

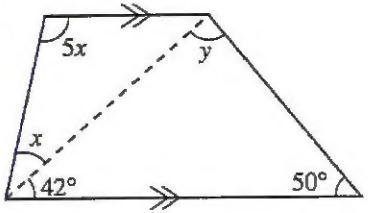
a



$y = 180 - (90 + 25)$

$= 65°$

b



$6x + 42 = 180$

$x = 23°$

$y = 180 - (50 + 42)$

$y = 88°$

Extension

11 Find the value of x in each of these quadrilaterals and hence state the type of quadrilateral it is.

a One with angles $x + 10$, $x + 20$, $2x + 20$, $2x + 10$

b One with angles $x - 10$, $2x + 10$, $x - 10$, $2x + 10$

c One with angles $x - 10$, $2x$, $5x - 10$, $5x - 10$

d One with angles $4x + 10$, $5x - 10$, $3x + 30$, $2x + 50$

a.) $6x + 60 = 360$

$x = 50°$

$60°$, $70°$, $120°$, $110°$

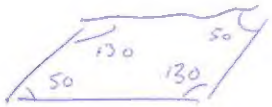
TRAPEZIUM

b.) $6x = 360$

$x = 60°$

50, 130

50, 130



PARALLELOGRAM OR RHOMBUS

c.) $13x - 30 = 360$

$x = 30°$

$20°$, $60°$, $140°$, $140°$

KITE

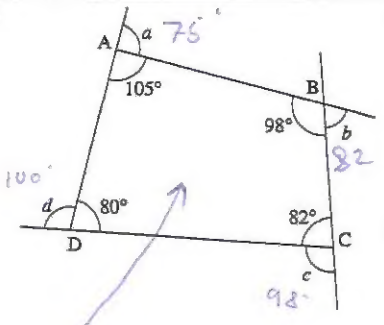
d.) $14x + 80 = 360$

$x = 20°$

$90°$, $90°$, $90°$, $90°$

SQUARE OR RECTANGLE

PROOF **12**



a The quadrilateral ABCD has interior angles 100°, 98°, 82° and 80°. Calculate the exterior angles (marked a, b, c, d) for each of the interior angles.
What is the sum of the angles a, b, c, d?

b Prove that the sum of the exterior angles of any quadrilateral is 360°.

$a + b + c + d = 355°$

NOT POSSIBLE QUADRILATERAL